



# US-CMS & Grid Interoperability

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# LHC Grids comprises of

- US grids (Open science grid **OSG**)
  - Uses virtual data catalog (**VDT**)
- LCG grids
  - Uses LHC computing grid project (**LCG**) that is built using some components of VDT. Support for LCG grid is provided by EGEE
- Nordu grids
  - Is a separate independent grid.

Some underlying technologies and protocols between the two types of grids are similar.



# Interoperations

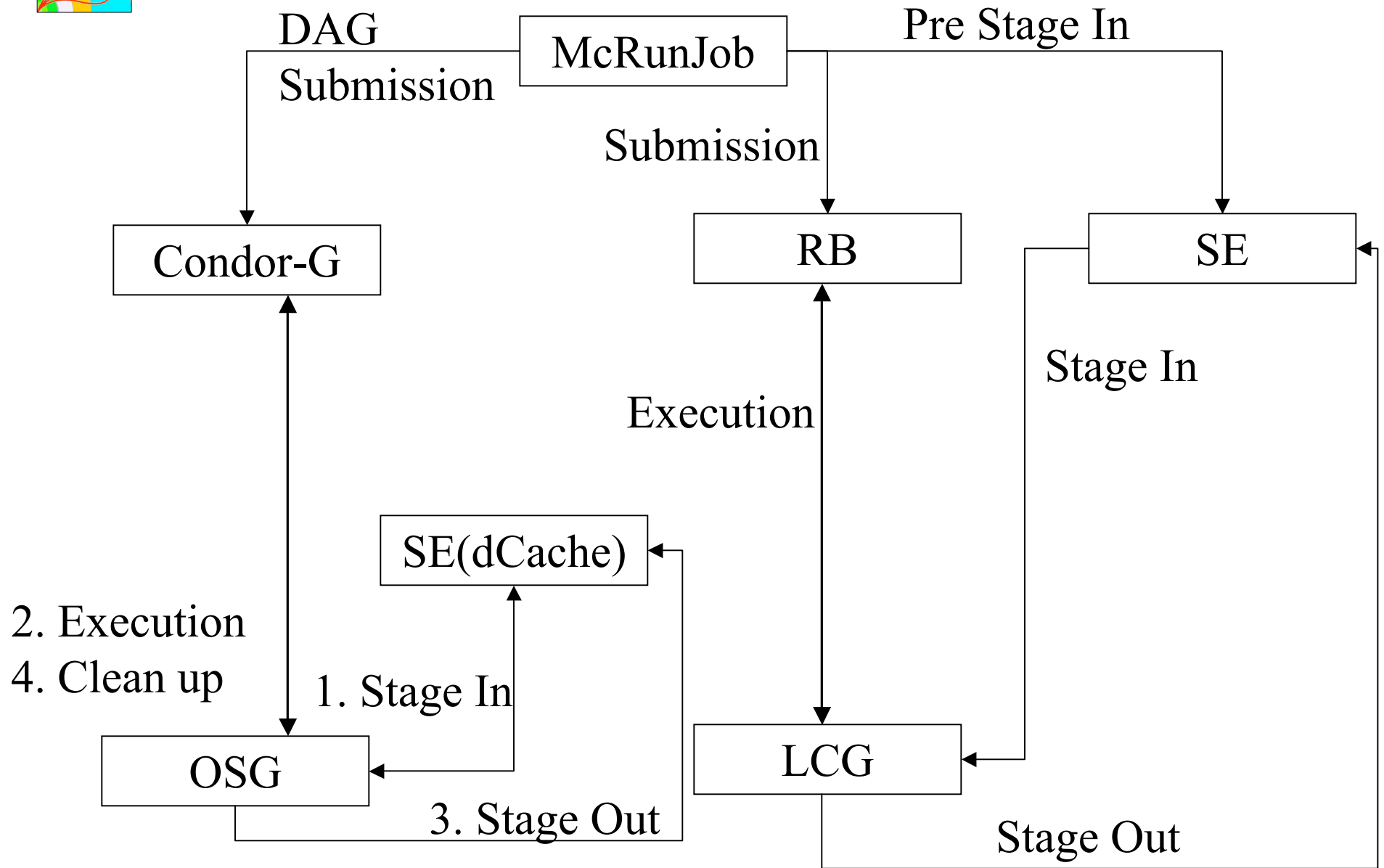
- Application generation & submission.
  - Preparation of the job such that it can be successfully queued to the particular type of grid.
  - Submission of the job such that it can use the interface provided by the particular type of grid.
- Application execution.
  - Site ability to expose interfaces of both grids and to execute the job in a coherent way.



# Application Generation and Submission

McRunjob was created in February of 2004 following on the successful attempt to isolate and re-engineer the common components between the existing (and related) DZero Runjob software and CMS McRunjob software

- CMS deliverable tool, responsible of complete life cycle of a single job: Generation, Stage in , Execution,, Stage out, Cleanup.
- <http://projects.fnal.gov/runjob/>
- Most grid processing done via McRunjob is repetitive and predictable. For example CMKIN, OSCAR, DIGI, DST, etc.



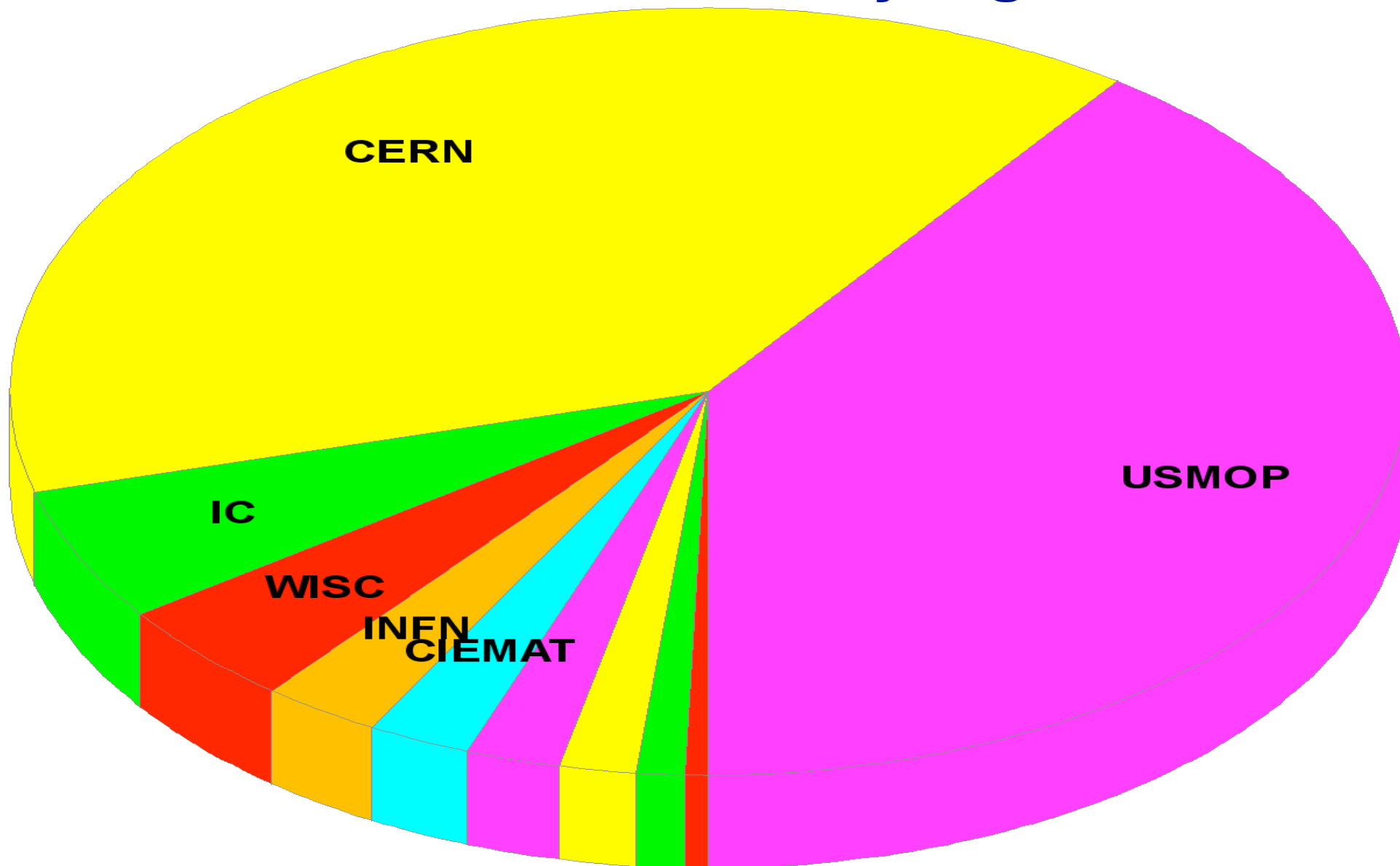


# Application Generation and Submission cont.

- In OSG, we submit a 4 node DAG to condor-g which executes stage in and stage out on remote head node (CE) and execution and cleanup nodes on the remote cluster (WN).
- In LCG, we submit the single job to RB which first selects the optimal CE (remote head node) , that in turn executes the job on any WN in the cluster (remote cluster). The stage in and stage out operations are also done in WN and is a part of the same job.



## Simulation Events Produced by Regional Center



41405957 events produced in total between 20031115 and 20050131



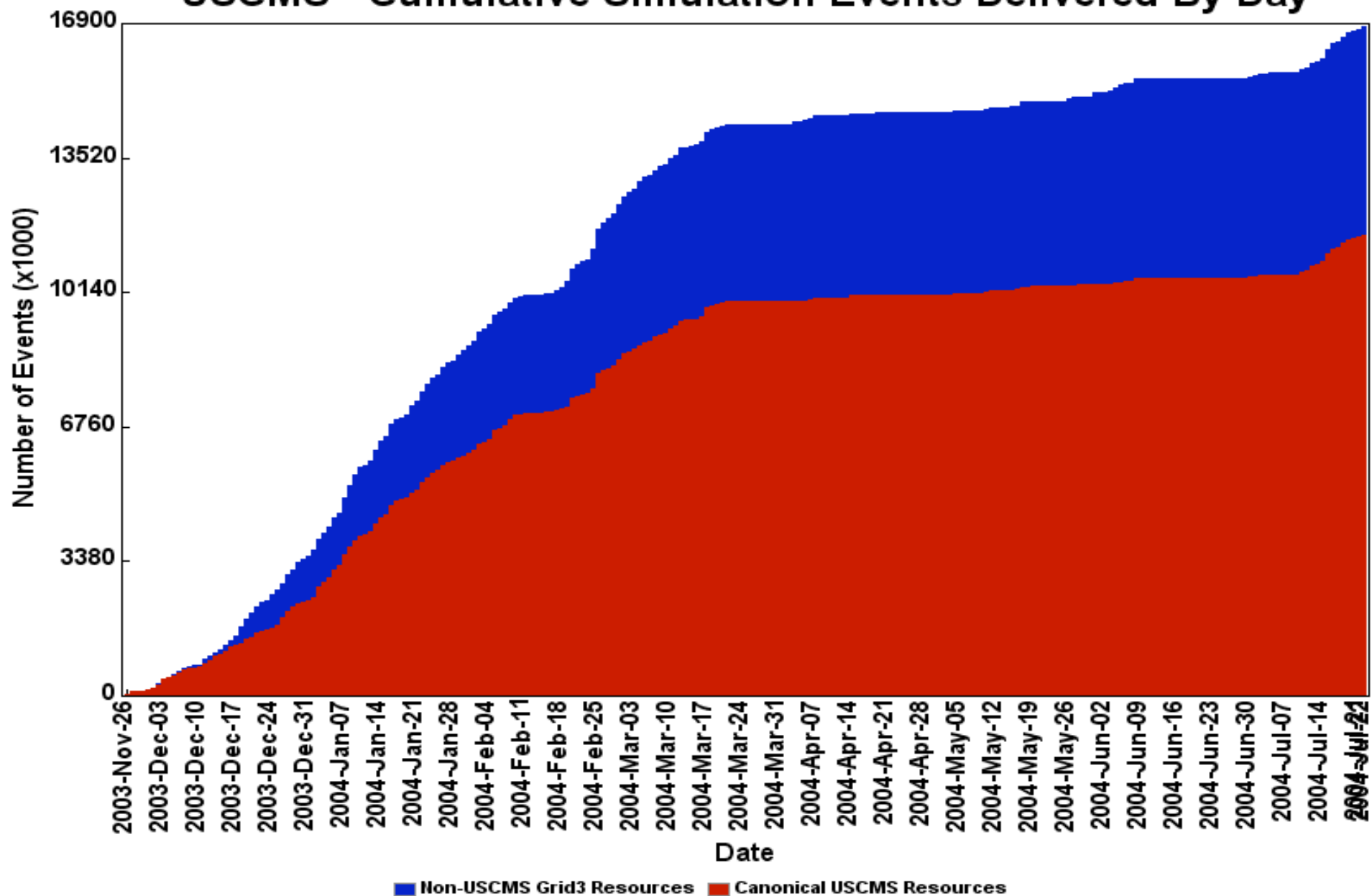
# CMS Events Production at OSG

- USMOP events are produced using McRunjob and they utilized most of the OSG Grid resources.
- Other events were produced at each center locally.
- We are aiming to use the grid as much as possible to reduce the number of human intervention in running the CMS production.
- We are aiming to utilize different grids to further enhance the production process.



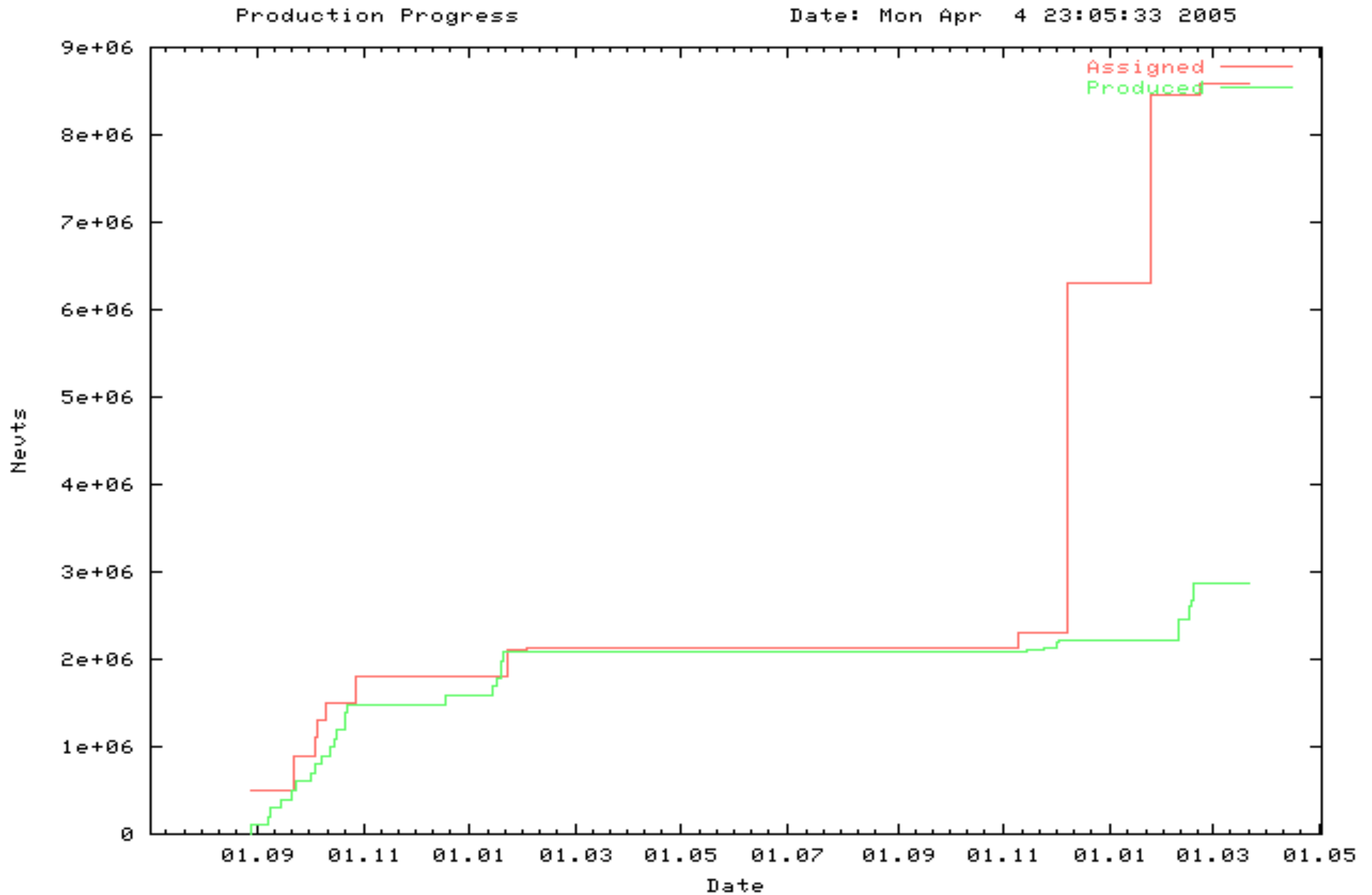


## USCMS - Cumulative Simulation Events Delivered By Day





# Simulation events produced at LCG Grid





# Application Execution

- Transparent user authorization
  - Virtual organization (VO) synchronization
- Site exposing multiple interfaces
  - OSG
  - LCG
- Information provider (IP) publishing site information in a coherent way



## OSG VOs

IVDGL VO  
SDSS VO  
USCMS VO  
LIGO VO  
...

## LCG VOs

DTEAM VO  
CMS VO  
ATLAS VO  
...

VOMRS  
VOMS

Protocol conversion

VOMS  
LDAP

VO Synchronizer

**Transparent User Authorization**



# Transparent User Authorization

- VOMS is now a part of VDT and is fully supported and easy to install and administer.
- There is an ongoing effort from VDT to smooth out the evolution and version issues of VOMS.
- Vo Synchronizer enables a user to transparently use both LCG and OSG grids.
- User information from LCG VOs are stored locally in a virtual VO here at FNAL.



# Users from USCMS

VOMRS - uscms - Mozilla Firefox

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BorderFactory (Java 2 Plat... Gmail - Inbox Yahoo! Mail - sekhrivijay@... VOMRS - uscms VOMRS - world

Rep DN ☐ Rep CA ☐ Aliases ☐ Groups [Roles] ☐

Search Reset

**Results**

First name	Last name	Email	Phone	Member DN
Abhishek Singh	Rana	rana@fnal.gov	858-822-6666	/DC=org/DC=doe grids/OU=People/CN=ABHISHEK SINGH RANA 681175
Alan	Smet	adesmet@cs.wisc.edu	6082653151	/DC=org/DC=doe grids/OU=People/CN=Alan De Smet 489066
Alan	Sill	Alan.Sill@ttu.edu	806-742-3730	/DC=gov/DC=fnal/O=Fermilab/OU=People/CN=Alan F. Sill/UID=alansill
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# Users from Cern CMS, Atlas and Dteam

VOMRS - world - Mozilla Firefox

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# VOMRS

- VOMRS is a server that provides the means for registering members of a VO, and coordination of this process among the various VO and grid resource administrators.
- It consists of a database to maintain user registration and institutional information, and a web user interface (web UI) for input of data into the database and manipulation of that data.
- Work is being done to integrate it with VDT



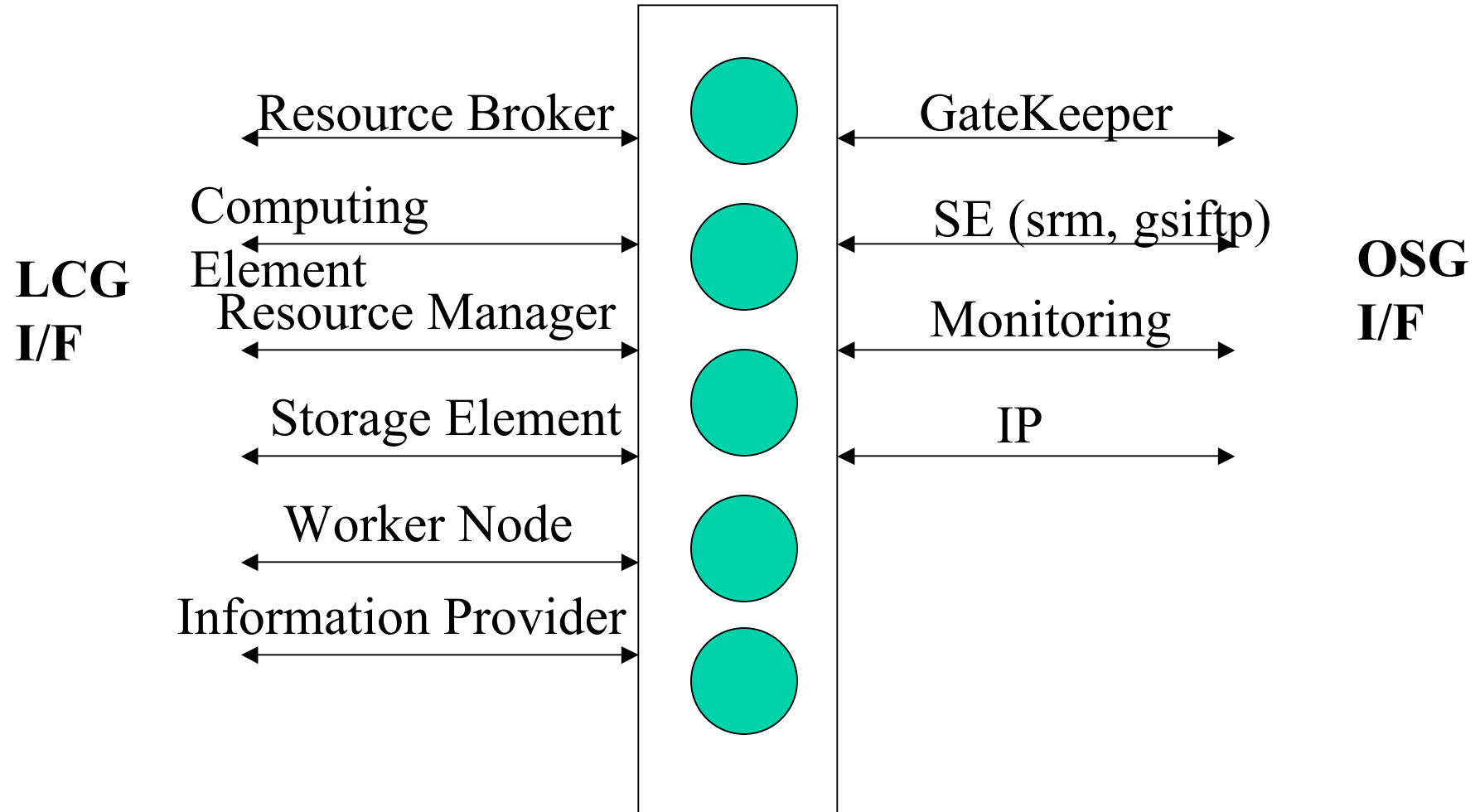


# Basic Features

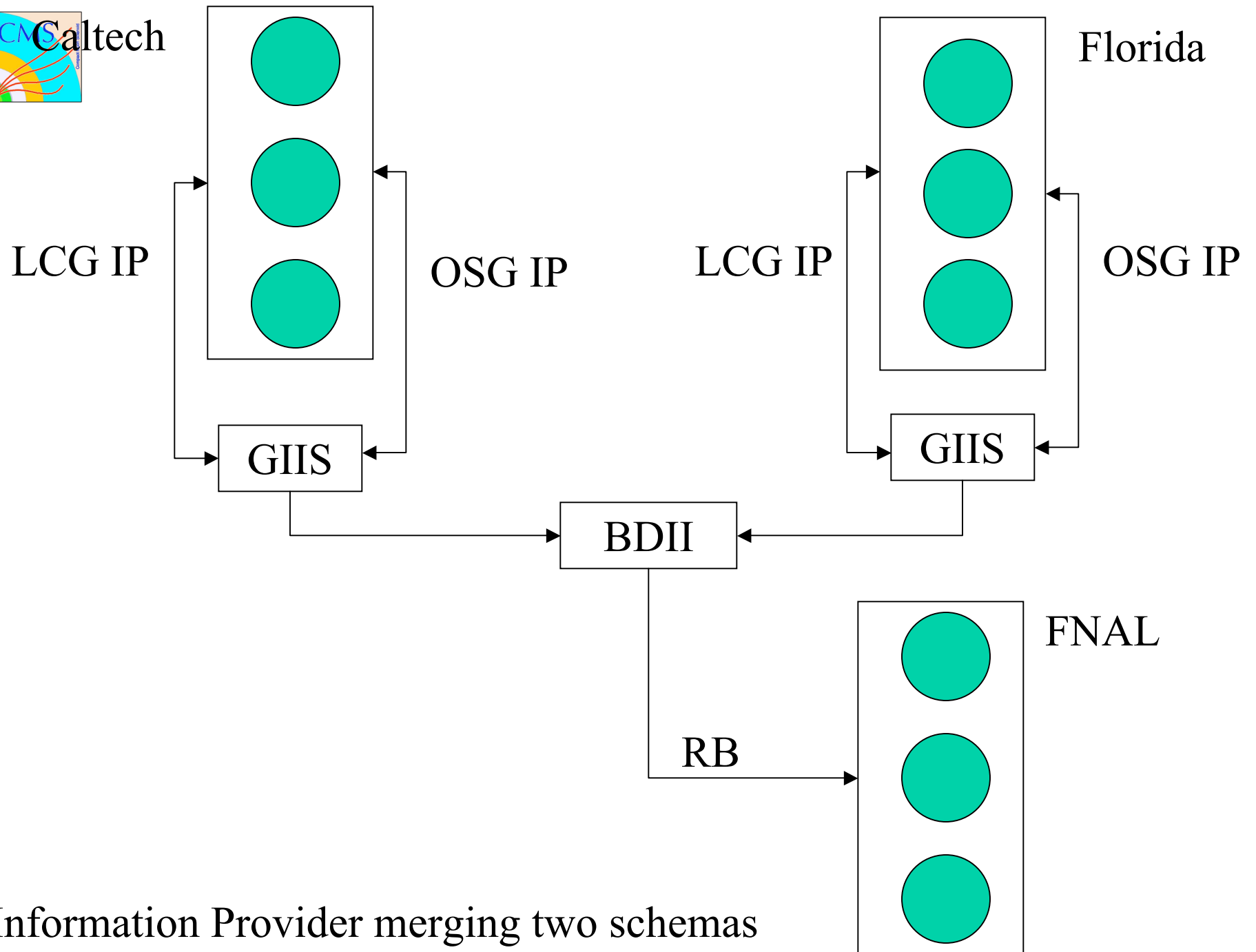
- Registration
- Approval, Suspension, Denial
- Multiple DNs
- More Private Information
- Multiple VOAdmins
- Multiple Representatives
- Groups
- Roles
- Institutions and Sites



## Condor Batch System



Site exposing multiple IFs at FNAL



Information Provider merging two schemas



# Outlook

- We have demonstrated reasonable use of grid resources for CMS production.
- We have implemented and prototyped some routines to achieve interoperability at various levels.
- Work is being done to completely merge the information provider's schema for different grid types.
- Having long term compatibility with accounting information is the goal for future.